

INTEGRATED CIRCUIT DEVICES INCLUDING EQUALIZATION/PRECHARGE CIRCUITS FOR IMPROVING SIGNAL TRANSMISSION

ABSTRACT OF THE DISCLOSURE

An integrated circuit device includes first and second complementary data line pairs, e.g., global or local I/O data line pairs, disposed on a substrate and extending along a first direction, the first and second complementary data line pairs arranged such that first and second data lines of the first complementary data line pair have a first data line of the second complementary data line pair disposed therebetween. An equalization transistor includes respective first and second source/drain regions in the substrate that are coupled to respective ones of the first and second data lines of the first complementary data line pair and an equalization transistor gate electrode disposed on the substrate between the first and second data lines of the first complementary data line pair. A first precharge transistor includes the first source/drain region, a third source/drain region in the substrate displaced from the first source/drain region along the first direction, and a first precharge transistor gate electrode disposed on the substrate between the first and third source/drain regions. A second precharge transistor includes the second source/drain region, a fourth source/drain region in the substrate displaced from the second source/drain region along the first direction, and a second precharge transistor gate electrode disposed on the substrate between the second and fourth source/drain regions. A precharge voltage bus conductor is disposed on the substrate and is electrically coupled to the third and fourth source/drain regions.